Linking Climate Adaptation and Development: A Synthesis of Six Case Studies from Asia and Africa

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1 Introduction

'To strengthen dry land agricultural systems, we must not focus on problems but on internal strengths and external opportunities.' (CRS, ODI, ICRISAT 2002)

The evidence that human induced climate change will affect many parts of the developing world is scientifically accepted (IPCC 2001). Africa and Asia have been identified by the Intergovernmental Panel on Climate Change (IPCC) as two of the major continents which will be most adversely affected. Much of the evidence for future impacts of climate change is based on global circulation model (GCM) results and more down-scaled regional climate models (RCMs) which generate future climate change scenarios and their potential impacts (IPCC 2001). However, human civilisation has been adapting to climatic conditions for a millennia. There is a great deal of knowledge and experience of coping with adverse climatic conditions, particularly in developing countries whose peoples and economies are more dependent on climate dependent activities. The Linking Climate Adaptation (LCA) case studies aim to collect examples of such experiences of coping with changing climatic conditions in three countries in Asia (China, India and Bangladesh) and three countries in Africa (Senegal, Kenya and Zimbabwe). The purpose was to seek lessons on how communities, institutions and countries were able to develop coping strategies to deal with the adverse climate conditions with a view to designing future adaptation strategies for dealing with human induced climate change.

The range of countries included large rapidly industrialising ones (such as China and India) as well as smaller, natural resource-based economies (such as Senegal, Kenya and Zimbabwe). The case studies represented a range of climate impacts and levels of responses ranging from small communities (in India, Zimbabwe and Kenya), regions (e.g. in China) to entire countries (e.g. Bangladesh). The main actors involved in undertaking adaptation also varied from local communities themselves (e.g. in Zimbabwe and India) to non-governmental organisations (NGOs) (e.g. Kenya), to regional governments (e.g. China) to national governments (Bangladesh). The climate stimulus that caused the actions also varied from drought (Kenya, Zimbabwe) to winds (Senegal) to floods (Bangladesh) and temperature changes (China). While most of the perceived climate impacts were negative (e.g. droughts, winds and floods), one was perceived to be positive (temperature changes in northeast China). Impacts included extreme events, such as floods, slow onset events such as droughts (Bangladesh, India, Zimbabwe and Kenya), as well as long-term trends such as increased mean temperature (China) and wind and precipitation changes (Senegal).

Rather than starting with GCM/RCM-derived impacts, the LCA case studies sought to identify recent (i.e. in the last few years) climatic impacts,

Table 1: Comparative Analysis of Six Country Case Studies of Adaptation

Parameters	**Country case studies**					
Countries:	**Bangladesh**	**India**	**China**	**Senegal**	**Kenya**	**Zimbabwe**
Climate stimulus	Floods	Drought	Temperature increase	Winds	Drought	Aridity/ drought
Intervention made	Flood and disaster preparedness	Adaptation to drought	Adaptation of crop practices	Tree plantation	Seed fairs	Water capture from rainfall
Locality/region	Most of the country	Villages in one state (Rajasthan)	Province (Heilongjiang, Jilin Liaoning) in Northeast China	Peri-urban area near Dakar (Sébikotane)	Eastern province	Tongwe area in Matabeleland (Beitbridge District)
Spatial scale	Almost whole country	Provincial level	Regional	Local	Local	Local (community)
Time-scale	Over 2 decades (1987–2004)	2 years (2001–3)	20 years (1982–2002)	10 years (1994–2004)	5 years (2000–4)	5 years (2000–4)
Main actors	National government	Local community	Provincial government	Private company/ NGO	NGOs	Local community/ authority
Supporting actors	NGOs, different government ministries, donors, local communities	NGOs, local government	Research institutes, local farmers	Government, NGOs, consumers	Local government, donors, local communities	Donors, local government
Funding sources	International donors, government	NGOs, local resources	Provincial government, farm credit	Private sector, international donors	International NGOs, CRS, ITDG, other donors	International/ local donor (UNDP)
Links to policy	National water/flood management Policies/ disaster management	National/ state drought management policies and water management	Agriculture policies	Agriculture policies	Disaster management and arid and semi-arid land policies	Aridity/ drought management policies

NGOs: non-governmental organisations; CRS: Catholic Relief Services; ITDG: Intermediate Technology Group; UNDP: United Nations Development Group.

which had been observed and perceived to be of major significance by the communities themselves. The studies examined what actions had been taken by different actors to adapt to the perceived changed climatic conditions focusing on different types of communities within the country. The case studies then tried to examine the ways in which each set of actors developed their respective strategies and overcame barriers on the way. The role of institutions and of funding was also examined as a key variable (in order to draw lessons for designing future interventions at the institutional and funding level).

The six case studies are included in this *IDS Bulletin*. The editorial overview provides the conceptual and methodological aspects of the LCA Project, including the case studies, in more detail. The main lessons from the case studies are drawn out in this article.

2 Climate experiences

Most countries have had to face adverse climatic conditions in part of the country for centuries and have established coping mechanisms for most adverse conditions (e.g. droughts, floods etc.). Thus, it is unlikely that future, human induced, climate change will cause some new and totally unknown conditions (except for some catastrophic changes such as the shut-down of the Atlantic gulf stream). Most of the adverse impacts expected from future climate change will be an intensification of known climatic hazards in places where they occur already, as well as increased occurrence in places where they have been rare in the past. Hence, much of the capacity to cope with adverse climatic conditions will, most likely, already exist in part of the countries (or in neighbouring countries), which can be used as lessons for adapting to future climate change.

The range of such existing climatic conditions in the six case studies includes the following:

1. Aridity/droughts in India, Kenya and Zimbabwe
2. Winds in Senegal
3. Floods in Bangladesh
4. Observed temperature increases in China

In each of the cases, the climatic phenomena were not new but were observed over long periods of time and there were some established coping strategies and mechanisms in place. However, in each of the countries, the latest results from the GCMs and RCMs indicate that these climatic hazards are likely to become more frequent and widespread with climate change in the future.

Thus the trends observed in the past in each of the case study areas can reasonably be expected to continue into the future with climate change. Hence, future strategies for adapting to climate change will be able to be based on previous experience and capacities to cope with such conditions, as described in the case studies.

3 The case studies

The six case studies are compared with respect to some key parameters in Table 1.

4 The role of institutions

Formal and informal institutions play a key role in identifying and then developing adaptive interventions. However, the type of institutions can be quite varied, from the national government (in the case of Bangladesh) to the provincial governments (e.g. in the case of China), to local communities (e.g. in India and Zimbabwe) to NGOs (e.g. in Kenya) and the private sector (e.g. in Senegal). An important lesson for identifying appropriate institutions as actors for future adaptation to climate change are to look for what formal and informal institutions (with the requisite knowledge, capacity and experience) already exist and try to build on them. The institutions may not necessarily be in the public sector but may be helped by policy-relevant interventions by national or local government. The roles played by different institutional stakeholders in these case study examples included the following:

1. Government: (a) National policy making (Bangladesh) and (b) Provincial policy making (China)
2. NGOs: Main initiators and actors (Kenya and Senegal)
3. Private sector: Main initiator and actor (Senegal)
4. Local communities: Main initiator and actor (Zimbabwe and India)
5. Donors: Critical supporters of local action (Kenya and Zimbabwe)
6. Local authorities: Critical supporters (Zimbabwe and Kenya)

5 The role of champions

The role of champions, or initiators of action is extremely important for successful adoption of any

intervention. In each case, the key actors played a crucial role (it may be argued that no intervention would have succeeded without the key role of the champions). Identifying such potential champions in any given locality or country is therefore an important element of success in making any new intervention on adaptation to future climate change. Effective champions had built up longstanding relationships of trust with the communities concerned. They were thus able to support or identify interventions that could both benefit the communities concerned as well as being favourably received by them (e.g. vermiculture in India).

6 The role of external donors

External donors played a key role in a number of cases (e.g. in Kenya and Zimbabwe). However, they were not so central in other cases (e.g. in China, India and Bangladesh). Thus, although external funding can sometimes play a key role in assuring success of an intervention, it is not always a necessary element for success. Therefore, an appropriate role for external donors wishing to enhance local adaptive capacities may be to identify and support such locally driven efforts by local actors on the ground. An interesting point to note was the role of two external donors, namely UNDP/GEF/SGP/Africa 2000 Network in Zimbabwe and CRS in Kenya, who worked through locally based chapters of their respective organisations to identify the interventions and support the local initiatives. This local knowledge, on the part of the external donors was essential for the success of the initiatives. It is clear that short-term interventions (e.g. emergency food aid in the Kenyan case) that are not well informed may undermine communities' long-term coping mechanisms and may result in permanent dependency. This suggests more work is needed to identify how short-term emergency relief can be made more sustainable in terms of its developmental impact.

7 The role of knowledge

The development of knowledge-based intervention and their successful deployment was a major element of the success in each of the case studies. In some cases (e.g. for agricultural production in China) it involved a significant linking of agriculture research institutes with the farmer innovation, and in others (e.g. in India) with innovative practices and scientific knowledge (e.g. vermiculture) brought from outside. In some cases, it was based entirely on indigenous knowledge (e.g. livelihood diversification in Zimbabwe) but provisioned in a structured form to allow such knowledge to be better utilised to increase economic and environmental resilience (e.g. organisation of seed fairs to distribute local seed varieties in Kenya to replace dependency on post-disaster seed distribution). Collectively, the case studies suggest that the role of knowledge (its generation, identification, utilisation, replication etc.) is likely to be a key element in any successful future work on building adaptive capacities to climate change. The development of such appropriate knowledge needs to be the centrepiece of any adaptive strategy for every country and internationally.

8 The role of research

In only one case study (namely, China) did the research community play an active, direct part in the intervention itself. Nevertheless, the results of research were instrumental in the successful interventions in a number of cases (e.g. India, Bangladesh, Kenya and Senegal), indicating the importance of longer-term linkages between policy and research. The type of research needed to take such interventions forward in the future goes well beyond the technical, scientific research (e.g. on new varieties of drought-resistant crops etc.) but also on social and institutional issues of making successful interventions, learning from those successes and replicating them on much larger scale. This is possible if dissemination of research outputs are strengthened at all levels. The Kenyan case study indicates that communities have extensive knowledge about which traits of seeds are best suited to local conditions. Such knowledge could serve to guide more formal science and technology (S&T) innovation processes which tend typically to be dominated by experts with a high level of scientific skills but less detailed local knowledge.

9 Future research agenda

Case study authors identified a number of future avenues for further research that would assist community level adaptation in the future. These include both generic research issues as well as country-specific research ideas:

1. General research ideas:
   (a) Identifying and mapping the most vulnerable locations/communities within each country
   (b) Documenting local/indigenous knowledge and experience to cope with climatic hazards and transferring the knowledge where needed
   (c) Scaling up best practices by communities on adaptation to climate variability
   (d) Integrating climate change adaptation into development activities and policies (mainstreaming)
   (e) Establishing emergency communication infrastructure for the communities to manage disasters.

2. Country-specific research ideas:
   (a) Bangladesh
   - Effective regional cooperation in terms of information sharing and regional capacity building, particularly with neighbouring countries.
   - Government bodies and NGOs working in the areas of disaster should develop regular contingency plans to respond to floods.
   - Structural measures such as rural infrastructure and flood shelters need to be designed in a participatory and socially responsive way, so that the poor and marginal groups can design as well as have access to these facilities.

   (b) China
   - Improved understanding of the physical and socio-economic consequences of different options for adaptation.
   - Studies that designate responsibility for action, by determining which adaptations are appropriate for which groups (e.g. producers, industry and government) and address the role of adaptation in decision making at different levels.
   - Better understanding of the mechanisms for expanding the general adaptive capacity of agriculture and forestry.
   - Studies that explore options to reduce both short- and long-term vulnerability of crops to diseases, insects and weed disturbances
   - Studies that focus on understanding and defining critical thresholds in water resource systems, rather than on the impacts of changes in mean conditions.
   - Cost-effectiveness analyses on adaptation options from various available measures for policy makers.

   (c) India
   - Specific case studies to capture regional and local dimensions are required. For this, there is an urgent need for pilot implementation studies. These implementation studies should be at micro- (village) as well as macro- (district, state) level.
   - There is a need to deal with equity issues and development constraints in market responses. Market responses must be matched with extensive access to insurance and more widespread introduction of micro-financing schemes and development banking.
   - The policies should give more focus on preparedness rather than relief.
   - A viable risk coverage policy is needed for a farmer-friendly and hassle-free credit delivery system.

   (d) Kenya
   - Since there are both losers (i.e. commercial seed companies) and beneficiaries (farmers and households), it is important that a further and thorough evaluation of seed fairs is carried out to see the net effect.
   - There may be a need to look at the issue of how quality control can be achieved in such initiatives which involve many people and are carried out within such a short time so that it can inform long-term adaptation to extreme climatic conditions.
   - There is a need to assess and come up with strategies that may ensure secure access to water resources in dryland areas. As dry areas get drier, the problem of water will intensify affecting all sectors including agriculture, which supports the majority of the population.
   - The positive role of seed fairs in conserving crop diversity needs to be evaluated further and strengthened.
   - Information sharing among affected/ vulnerable communities needs to be strengthened. Documenting indigenous knowledge could contribute significantly towards achieving this objective.

   (e) Senegal
   - The positive results achieved in producing productive agriculture landscapes in Sébikotane could also inspire plans for urban agriculture in a bid to eradicate poverty.

- In this way, the example of Sébikotane could be invoked to help update traditional good agricultural practices by rendering them more efficient (thanks to scientific research) and enhancing the technologies used, and harnessing social innovations.
- There is also ample scope for further in-depth study of Sébikotane to determine which of the innovative aspects could be best combined with more traditional agricultural practices.

(f) Zimbabwe

- Identifying and mapping vulnerable areas and regions to climate change in Zimbabwe.
- Communicating information on weather forecasting to rural communities as an adaptation strategy to climate variability.
- Establishing emergency communication infrastructure for communities.
- Formulating policies and programmes to address the impact of climate change with a bottom-up approach and the associated socio-economic benefits.
- Marketing and costing of diversified drought-resistant crops and draught animals.

10 Conclusions

A number of conclusions (aimed at enhancing research capabilities and building adaptive capacity in developing countries in the future) can be drawn from the case studies. These include:

- Adaptation strategies for coping with future climate change impacts can use previous experience and knowledge of communities in regions already subject to climatic hazards.
- In most countries, there are already regions and communities that have faced adverse climatic hazards and have developed coping strategies that can be used or enhanced as the basis for future adaptation to climate change.
- A wide range of institutions can act as champions for adaptation actions ranging from governmental to non-governmental organisations to the private sector and research organisations.
- Interventions to enhance adaptation are more likely to be successful if based on indigenous actors, as they are more likely to have the trust and knowledge of local communities relevant to enhancing sustainable livelihoods.
- External donors can play a positive role in enhancing adaptation, provided it is used for strengthening local capacities in a way that avoids creation of long-term dependencies.
- Use of knowledge (and its generation through research and dissemination through outreach activities) is likely to be a critical factor in successful adaptations.

To summarise, the case studies support the conclusions reached elsewhere on effective global citizen action: that research must be participatory; policy analysis sophisticated as well as legitimate and reality checked (both more likely if it has been jointly developed between holders of different kinds of knowledge); and because realities are ever changing, those involved in linking micro- to macro-realities and in policy advocacy should engage in organisational learning.

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